APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/098,617	03/18/2002	Masayuki Sakakura	12732-094001 / US5593/561	3682

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EXAMINER	
ARTMAN, THOMAS R	

ART UNIT	PAPER NUMBER
2882	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/19/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/098,617	SAKAKURA ET AL.	
	Examiner	Art Unit	
	Thomas R. Artman	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,5,8,11,14,17,20,23,26,29,32,35,38,41,44,47,50 and 53-103* is/are pending in the application.

4a) Of the above claim(s) *53-88* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,5,8,11,14,17,20,23,26,29,32,35,38,41,44,47,50 and 89-103* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 October 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/7/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 14, 35, 41, 47, 89, 90, 94-96 and 98-100 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (US 6,246,179 B1) in view of Miyauti et al. (JP 11-31587).

Regarding claims 2, 14, 89 and 90, Yamada discloses a light-emitting device (Figs.4A-4B), including:

a) a first electrode 61 formed on an insulating surface 17,

b) a first insulating layer 19 covering an end portion of the first electrode and comprising a tapered edge θ1,

c) an organic compound layer 66 formed on the first electrode, and

d) a second electrode 67 formed on the organic compound layer.

Yamada does not specifically disclose the use of a second insulation layer, particularly one comprising diamond-like carbon, between the first electrode and the organic compound layer; the first electrode is directly connected to the organic compound layer.

Miyauti specifically teaches the practice of depositing a thin insulation layer 3 made of DLC between a first electrode 2 and an organic compound layer 4 and 5 in a light-emitting

device. The DLC layer is chemically stable and thus shields the organic compound layer from the instabilities of the ITO electrode 102, see par.0036 of Miyauti. The examiner notes that the first electrode 61 of Yamada is also made of ITO, and thus would suffer the same drawback identified in Miyauti.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the light emitting device of Yamada to have a thin insulation layer made of carbon between the first electrode and the organic compound layer as shown by Miyauti in order to improve the stability and longevity of the pixel, as taught by Miyauti. As a result of the addition of this layer, the first electrode is not in direct contact with the organic compound layer.

With respect to claims 35 and 94, the insulating layer of Miyauti (DLC layer 3) has thicknesses overlapping the range of 1-10 nm thick (par.0033, Table 1).

With respect to claims 41 and 95, the insulating surface 17 of Yamada is made of at least a polyimide or acrylic resin (col.6, lines 2-4).

With respect to claims 47 and 96, the light emitting device of Yamada is capable of being used for computers, digital cameras, video cameras and mobile phones. The examiner notes that such limitations result in an intended use of the light emitting device that carry no structural distinction over the prior art of record. Such limitations carry no patentable weight.

With respect to claims 98-100, the presence of the second insulating layer between the first electrode and the organic compound layer of the Yamada/Miyauti prior art combination provides a tunneling current/junction between the first electrode and the organic compound layer.

Claims 2, 8, 14, 35, 41, 47, 89, 94-96 and 98-100 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Nagayama et al. (JP 11-224781).

Regarding claims 2, 14 and 89, Yamada discloses a light-emitting device (Figs.4A-4B), including:

a) a first electrode 61 formed on an insulating surface 17,

b) a first insulating layer 19 covering an end portion of the first electrode and comprising a tapered edge θ1,

c) an organic compound layer 66 formed on the first electrode, and

d) a second electrode 67 formed on the organic compound layer.

Yamada does not specifically disclose the use of a second insulation layer, particularly comprising carbon, between the first electrode and the organic compound. As a result, the first electrode is directly connected to the organic compound layer.

Nagayama specifically teaches the practice of depositing a thin insulation layer 109, having carbon as a main component (polyimide, a carbon-based polymer, par.0023), between a first electrode 102 and an organic layer 103 in a light-emitting device. The additional layer protects the device from instabilities caused by contaminants and/or an irregular shape of the first

electrode (par.0018). In this way, the light emitting device is more immune to manufacturing flaws, thus improving reliability.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the light emitting device of Yamada to have a thin insulation layer between the first electrode and the organic compound layer as shown by Nagayama in order to improve the stability and longevity of the pixel, as taught by Nagayama. As a result of the addition of this layer, the first electrode is not in direct contact with the organic compound layer.

With respect to claim 8, the insulating layer of Nagayama is made of silicon oxide or silicon nitride (par.0023).

With respect to claims 35 and 94, the insulating layer of Nagayama has thicknesses overlapping the range of 1-10 nm thick (pars.0015 and 0024).

With respect to claims 41 and 95, the insulating surface 17 of Yamada is made of at least a polyimide or acrylic resin (col.6, lines 2-4).

With respect to claims 47 and 96, the light emitting device of Yamada is capable of being used for computers, digital cameras, video cameras and mobile phones. The examiner notes that such limitations result in an intended use of the light emitting device that carry no structural distinction over the prior art of record. Such limitations carry no patentable weight.

With respect to claims 98-100, the presence of the second insulating layer between the first electrode and the organic compound layer of the Yamada/Nagayama prior art combination provides a tunneling current/junction between the first electrode and the organic compound layer.

Claims 2, 5, 14, 17, 35, 38, 47, 50, 89, 90, 94 and 96-103 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urabe (US 6,614,174 B1) in view of Miyauti et al. (JP 11-31587).

Regarding claims 2, 5, 14, 17, 89, 90 and 97, Urabe discloses a light-emitting device (Figs.1 and 4C), including:

a) a TFT (Fig.1) having a source region S and a drain region D,

b) an interlayer insulating film 50 over the source and drain regions,

c) a drain electrode M connected to the drain region through an opening formed in the interlayer insulating film,

d) a first electrode A formed on the interlayer insulating film and connected to the drain electrode (through CON),

e) a first insulating layer 15 having an opening on the first electrode (Fig.4C) and comprising a tapered edge,

f) an organic compound layer 10 formed on the first electrode, and

g) a second electrode K formed on the organic compound layer.

Urabe does not specifically disclose the use of a second insulation layer, particularly one comprising diamond-like carbon, between the first electrode and the organic compound. As a result, the first electrode is directly connected to the organic compound layer.

Miyauti specifically teaches the practice of depositing a thin insulation layer 3 made of DLC between a first electrode 2 and an organic compound layer 4 and 5 in a light-emitting device. The DLC layer is chemically stable and thus shields the organic compound layer from the instabilities of the underlying electrode 102, see par.0036 of Miyauti.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the light emitting device of Urabe to have a thin insulation layer between the first electrode and the organic compound layer as shown by Miyauti in order to improve the stability and longevity of the pixel, as taught by Miyauti. As a result of the addition of this thin layer, the first electrode is not in direct contact with the organic compound layer.

With respect to claims 35, 38 and 94, the insulating layer of Miyauti (DLC layer 3) has thicknesses overlapping the range of 1-10 nm thick (par.0033, Table 1).

With respect to claims 47, 50 and 96, the light emitting device of Urabe is capable of being used for computers, digital cameras, video cameras and mobile phones. The examiner notes that such limitations result in an intended use of the light emitting device that carry no structural distinction over the prior art of record. Such limitations carry no patentable weight.

With respect to claims 98-103, the presence of the second insulating layer between the first electrode and the organic compound layer of the Urabe/Miyauti prior art combination provides a tunneling current/junction between the first electrode and the organic compound layer.

Claims 2, 5, 8, 11, 14, 17, 20, 23, 29, 32, 35, 38, 41, 44, 47, 50, 89, 91 and 93-103 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urabe in view of Nagayama et al. (JP 11-224781).

Regarding claims 2, 5, 14, 17, 89 and 97, Urabe discloses a light-emitting device (Figs.1 and 4C), including:

a) a TFT (Fig.1) having a source region S and a drain region D,

b) an interlayer insulating film 50 over the source and drain regions,

c) a drain electrode M connected to the drain region through an opening formed in the interlayer insulating film,

d) a first electrode A formed on the interlayer insulating film and connected to the drain electrode (through CON),

e) a first insulating layer 15 having an opening on the first electrode (Fig.4C) and comprising a tapered edge,

f) an organic compound layer 10 formed on the first electrode, and

g) a second electrode K formed on the organic compound layer.

Urabe does not specifically disclose the use of a second insulation layer, particularly one comprising carbon, between the first electrode and the organic compound. As a result, the first electrode is directly connected to the organic compound layer.

Nagayama specifically teaches the practice of depositing a thin insulation layer 109, having carbon as a main component (polyimide, a carbon-based polymer, par.0023), between a first electrode 102 and an organic layer 103 in a light-emitting device. The additional layer protects the device from instabilities caused by contaminants and/or an irregular shape of the first electrode (par.0018). In this way, the light emitting device is more immune to manufacturing flaws, thus improving reliability.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the light emitting device of Urabe to have a thin insulation layer between the first electrode and the organic compound layer as shown by Nagayama in order to improve the stability and longevity of the pixel, as taught by Nagayama. As a result of the addition of this layer, the first electrode is not in direct contact with the organic compound layer.

With respect to claims 8 and 11, the insulating layer of Nagayama is made of silicon oxide or silicon nitride (par.0023).

With respect to claims 20, 23 and 91, Urabe does not specifically disclose that the interlayer insulating film 50 is made of silicon nitride or silicon oxynitride. The layer is made of silicon oxide. However, Urabe does specifically teach that silicon oxide is not limiting, and that

other similar known materials can be used for an insulating layer (col.6, lines 34-37, "silicon dioxide or the like").

Nagayama provides known functional equivalent layers to silicon oxides in par.0023. Specifically, Nagayama equates silicon oxides and silicon nitrides as being equally suitable for an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the interlayer insulating film of Urabe to be made of silicon nitride as taught by Nagayama as being known functionally equivalent materials and equally suitable to the purpose subject to availability.

With respect to claims 29, 32, 41, 44, 93 and 95, Urabe does not specifically disclose that either the first insulating layer 15 or the interlayer insulating film 50 is made of a polyimide or acrylic resin. The layer is made of silicon oxide. However, Urabe does specifically teach that silicon oxide is not limiting, and that other similar known materials can be used for an insulating layer (col.6, line 23; col.7, lines 58-65, "silicon dioxide or the like" and "the material...is not specially limited.").

Nagayama provides known functional equivalent layers to silicon oxides in par.0023. Specifically, Nagayama equates silicon oxides and polyimides as being equally suitable for an insulating layer. Furthermore, polyimides are simpler to manufacture, simply requiring a spin coating process rather than vacuum-based vapor deposition processes, which take longer and are more expensive.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for either the first insulating layer or the interlayer insulating film of Urabe to be made of polyimide as taught by Nagayama as being known functionally equivalent materials and equally suitable to the purpose subject to availability, as well as more efficient, cost-effective manufacture.

With respect to claims 35, 38 and 94, the insulating layer of Nagayama has thicknesses overlapping the range of 1-10 nm thick (pars.0015 and 0024).

With respect to claims 47, 50 and 96, the light emitting device of Urabe is capable of being used for computers, digital cameras, video cameras and mobile phones. The examiner notes that such limitations result in an intended use of the light emitting device that carry no structural distinction over the prior art of record. Such limitations carry no patentable weight.

With respect to claims 98-103, the presence of the second insulating layer between the first electrode and the organic compound layer of the Urabe/Nagayama prior art combination provides a tunneling current/junction between the first electrode and the organic compound layer.

Claims 26 and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urabe and Nagayama, as applied to claims 5 and 89 above, in view of Yamada.

Urabe discloses an interlayer insulating film of two layers 33 and 50.

However, Urabe does not specifically disclose the practice of making one layer out of a polyimide or acrylic resin, and another layer out of silicon nitride or silicon oxynitride. Urabe discloses that both layers are made of silicon dioxide, and that other known materials may be easily substituted (col.6, lines 1-3 and lines 15-17).

As stated in the above rejections to claims 20, 23, 29 and 32, the Urabe/Nagayama combination provides known functional equivalent layers to silicon oxides, specifically silicon nitrides and polyimides, as functional equivalents known in the art, and the greater ease of manufacture in the case of using polyimides.

Further regarding claims 26 and 92, neither Urabe nor Nagayama specifically teach that the first layer is a polyimide and that the second layer is a silicon nitride.

Yamada specifically teaches the practice of having an interlayer insulating film with two layers 15 and 17, where the first layer 17 is a polyimide, being used as an insulating planarization layer, (col.6, lines 21-24), and where the second layer 15 is made at least partially of silicon nitride (col.6, lines 15-19). In this way, a sufficient insulating/passivation layer is formed over the TFT circuitry while providing a planarizing layer of organic resin in order to easily level the structure in order to provide a properly flat surface upon which to form the EL device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the first and second layers of the interlayer insulating film of Urabe to be made of polyimide and silicon nitride, respectively, in order to provide the necessary insulation and passivation of the TFT structures while providing a simple and cost-effective planar surface upon which to fabricate the EL device.

Response to Arguments

Applicant's arguments filed October 19th, 2006, have been fully considered but they are not persuasive. Applicants assert that the prior art combinations above do not teach that the second insulating layer is formed on top of the first insulating layer, as well as the first electrode. The examiner respectfully disagrees.

As the examiner understands the claims, the significance of the invention lies in having the second insulating layer separating the organic compound layer and the first electrode in order to significantly improve the reliability and efficiency of the electrode/organic layer interface. This is clearly taught in both secondary references Miyauti and Nagayama.

Furthermore, the teachings of Yamada and Urabe (particularly Yamada) specifically point out the importance of the relationship between the tapers of the first insulating later and the first electrode.

It is the examiner's position that it is inherent for the second insulating layer to be formed on first insulating layer. As is seen from the teachings of Yamada, it is important for the first insulating layer to be in contact with the first electrode in order for the tapered edges of the first insulating layer to perform their function. As is seen from the teachings of Miyauti and

Nagayama, an insulating layer is needed between the first electrode and the organic compound layer in order to significantly improve the reliability and efficiency of the electrode/organic layer interface.

Therefore, given the specific teachings of the prior art references Yamada and Urabe, and given the specific teachings of the secondary references Miyauti and Nagayama, the prior art combinations cited above provide a prima facie case of obviousness over the rejected claims. The combinations mutually benefit from the advantages disclosed, and the functionality of the individual prior art inventions are not destroyed or otherwise rendered inoperable.

Therefore, Applicants' arguments are not persuasive, and the rejections are maintained above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yamada (US 6,246,179 B1) further teaches structure similar to claim 5 except for the fact that the anode of the EL device is connected to the source, rather than the drain, of the TFT, as well as the lack of the second insulation layer.

Tang (US 5,550,066) teaches a device structure similar to that of Urabe and Yamada.

Yamada (US 6,072,450) teaches a structure similar to that claimed, including the second insulation layer being used as a barrier and operates under the tunneling effect (col.11, lines 28-46), except that the first electrode is connected to the source, rather than the drain, of the TFT.

Yamazaki (US 6,583,471 B1), Yamazaki (US 6,903,377 B2) and Inukai (US 6,680,577 B1) are commonly-owned patents disclosing similar structures to that claimed above.

Yuan (US 6,509,574 B2) teaches the known advantages of providing a thin dielectric (insulating) layer between an organic EL layer and a metal electrode (col.2, lines 24-40) for improved electron injection via tunneling.

Kawai (US 6,636,001 B2) teaches the known practice of providing an insulating layer for effecting carrier injection via tunneling.

Tanaka (US 7,042,152 B2) and Okada (US 6,858,271 B1) discuss tunneling effects between organic EL layers and metal electrodes.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas R. Artman
Patent Examiner

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